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(54) **APPARATUS AND METHOD FOR SECURING AN END OF A STRIP TO A TAMBOUR**

(75) Inventors: **Wolfgang Kowalewski**, Quebec (CA); **Roman Caspar**, Quebec (CA)

(73) Assignee: **PAPRIMA INDUSTRIES, INC.**, Dorval (Montreal) (CA)

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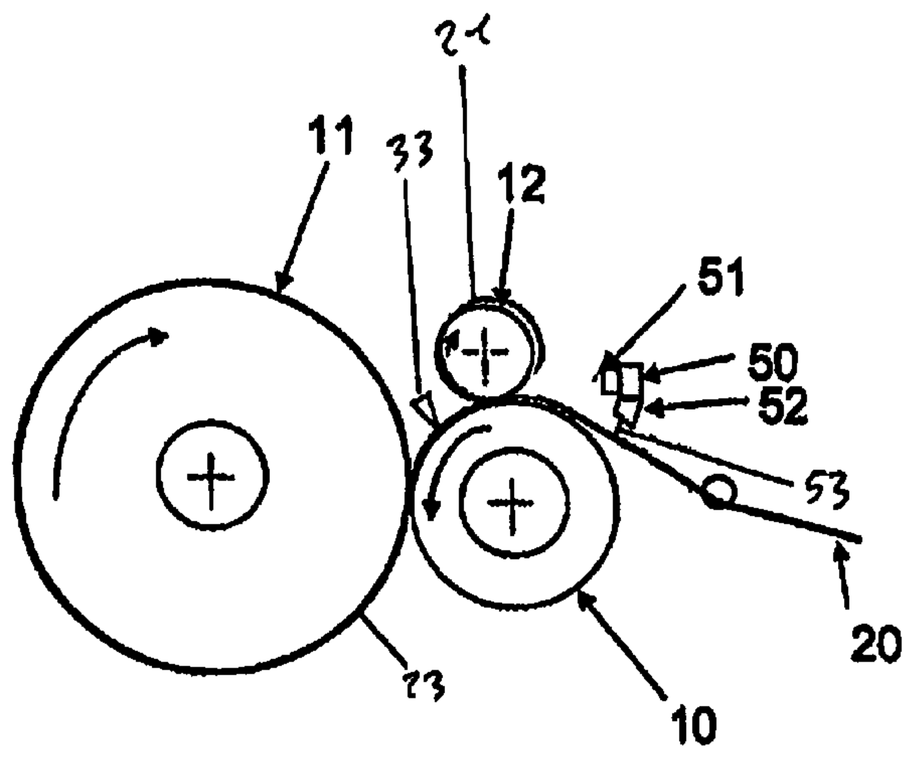
Primary Examiner — Philip Tucker
Assistant Examiner — Vicki Wu
(74) *Attorney, Agent, or Firm* — Leydig, Voit & Mayer, Ltd.

(57) **ABSTRACT**

A method for securing a web end of a paper web on a first drum during a change of drum, the method includes passing the web end through a nip between a Pope roller and the second drum and applying adhesive to an area of the web end on a downward-rotating area of the Pope roller after the web end is passed through the nip.

10 Claims, 5 Drawing Sheets



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B65H 19/26 (2006.01)
B65H 19/28 (2006.01)

(52) **U.S. Cl.**
CPC *B65H 2301/414421* (2013.01); *B65H 2301/414433* (2013.01); *B65H 2301/414436* (2013.01); *B65H 2301/414443* (2013.01); *B65H 2301/46* (2013.01); *B65H 2301/51534* (2013.01); *B65H 2408/22* (2013.01); *B65H 2408/236* (2013.01)

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USPC 156/250
See application file for complete search history.

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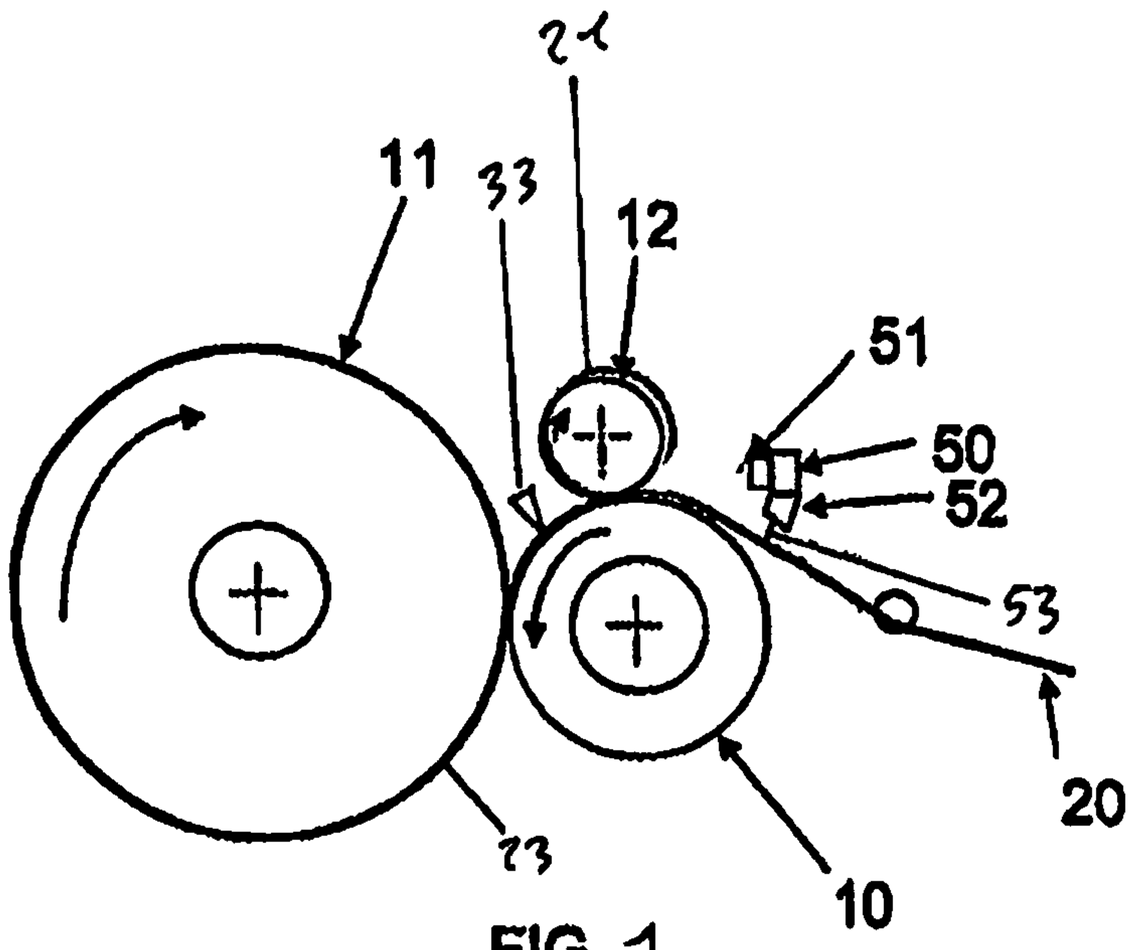

FIG. 1

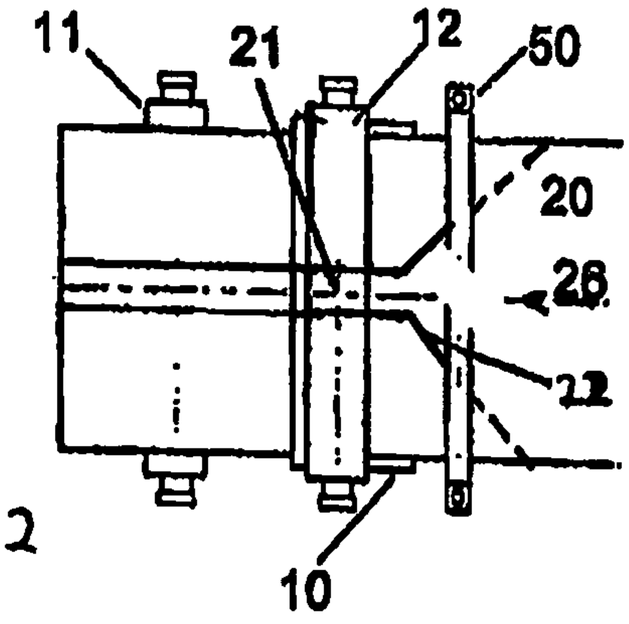

Fig. 2

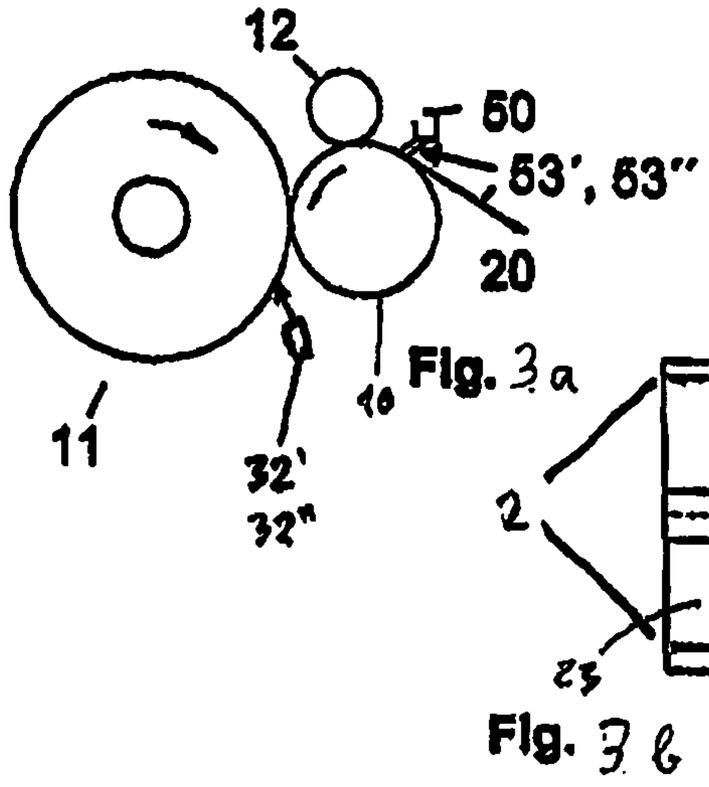

Fig. 3a

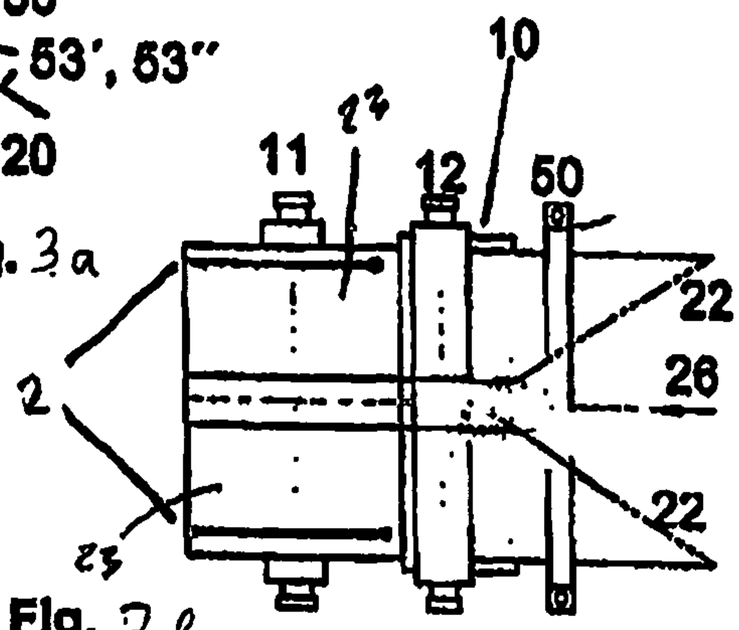

Fig. 3b

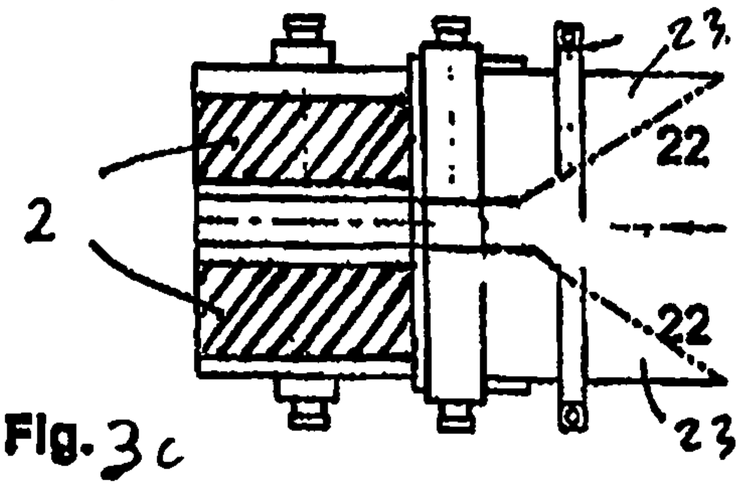

Fig. 3c

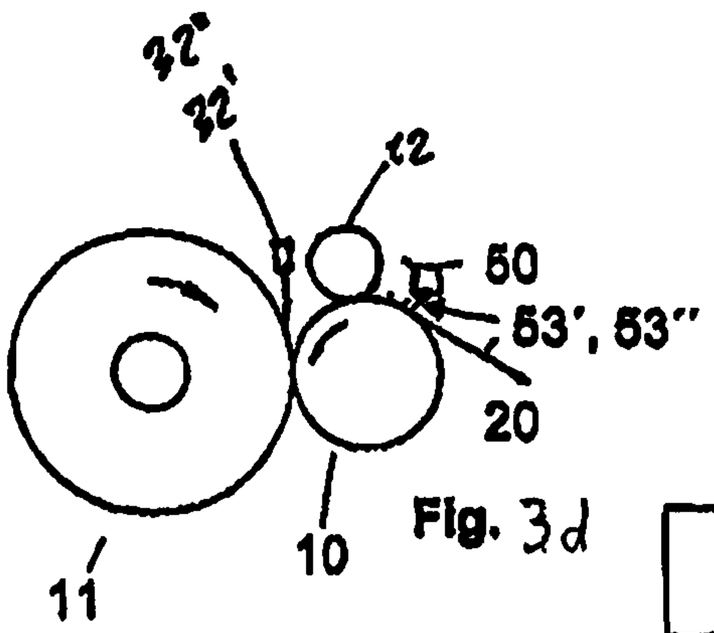

Fig. 3d

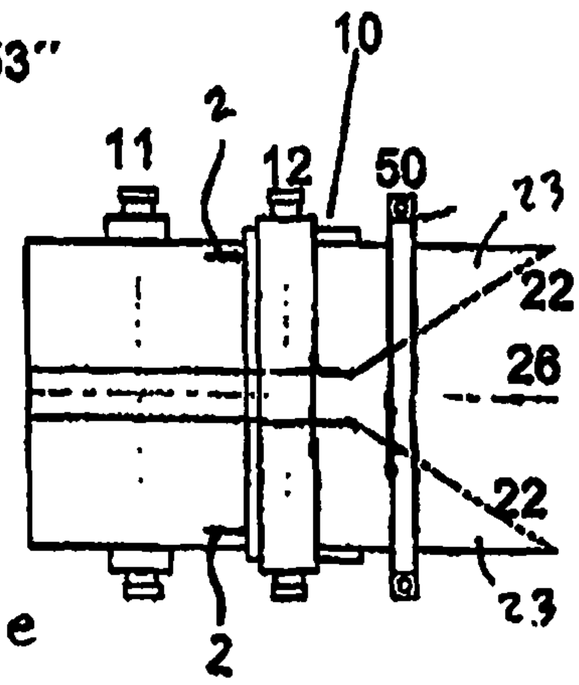

Fig. 3e

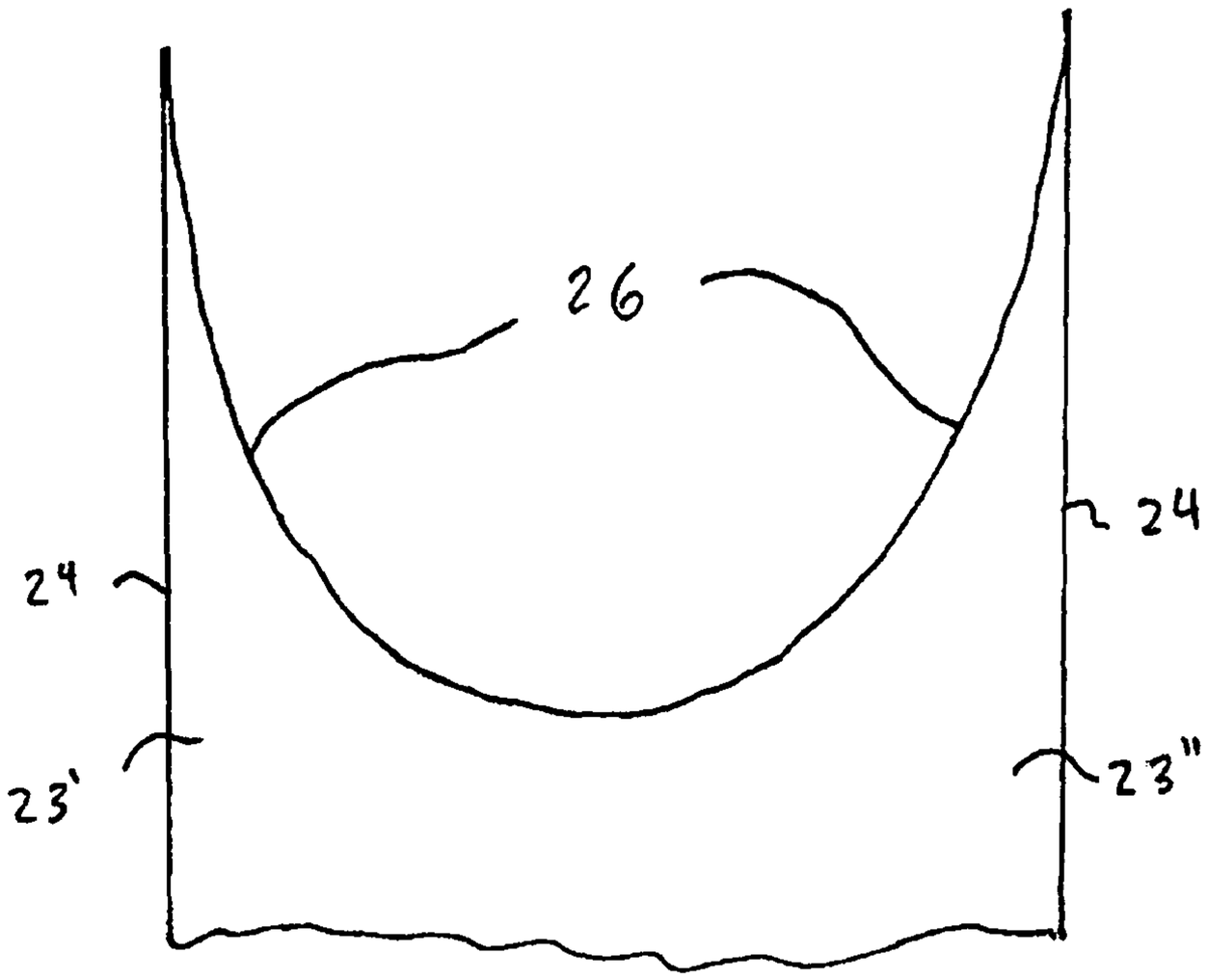

Fig. 4a

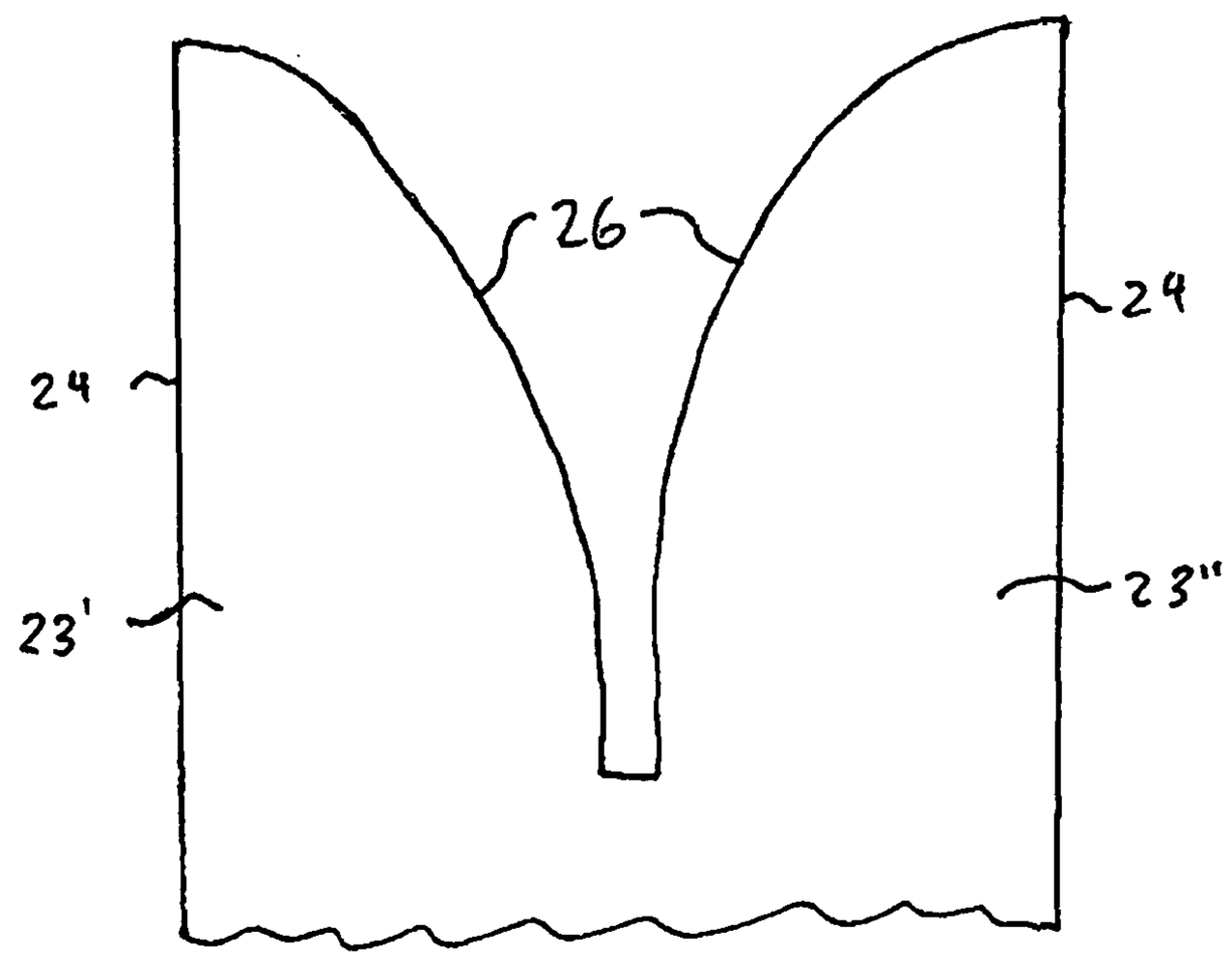

Fig. 4b

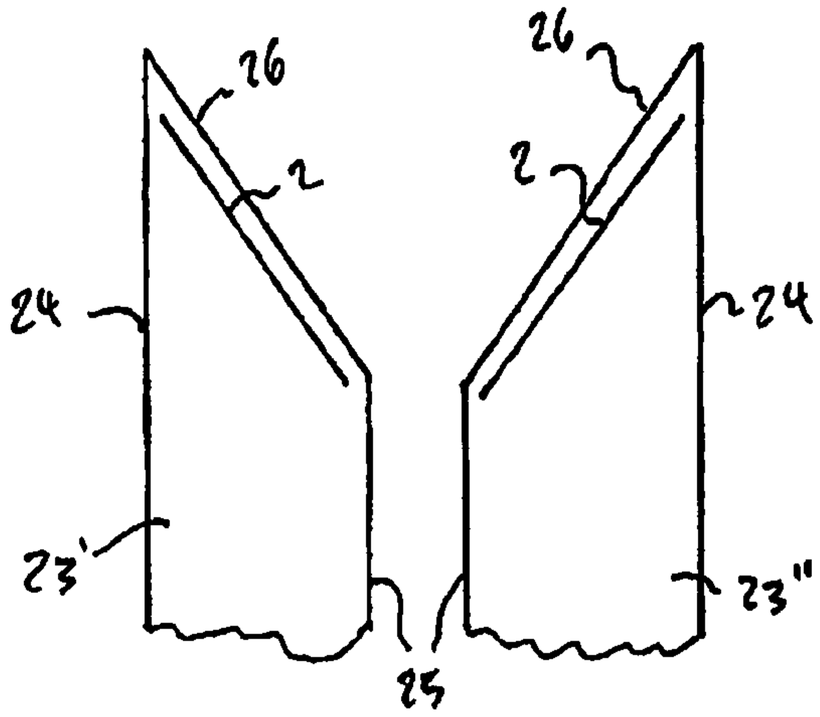

Fig. 5a

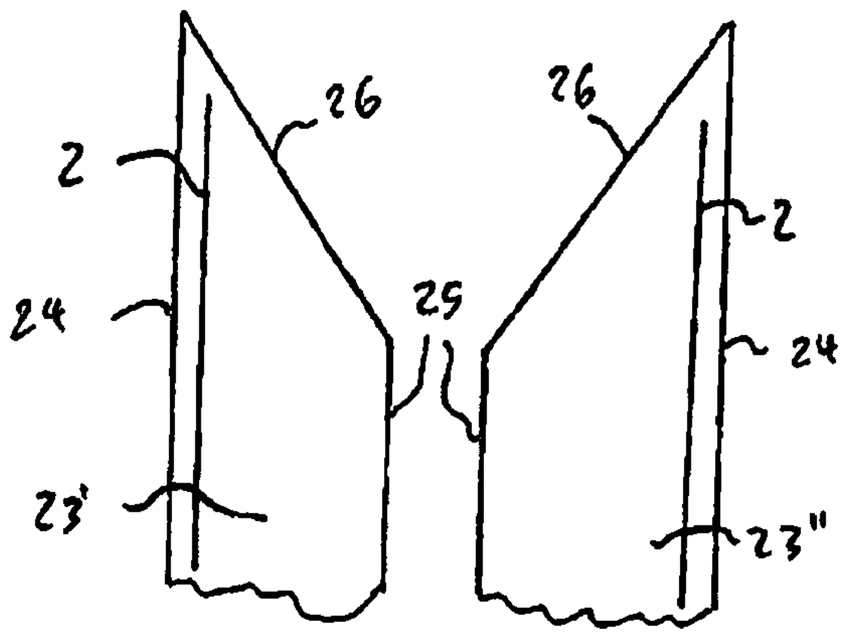

Fig. 5b

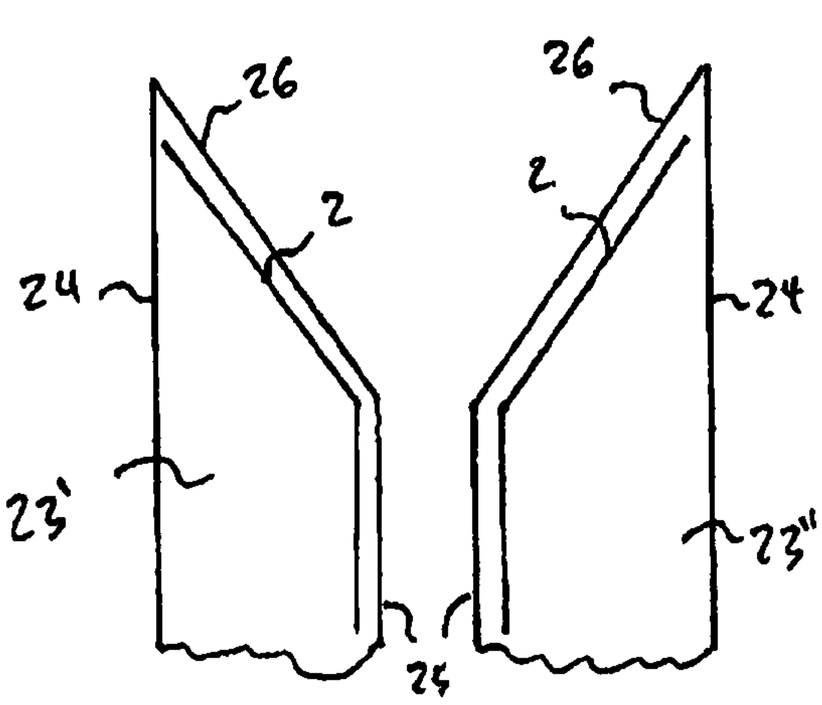

Fig. 5c

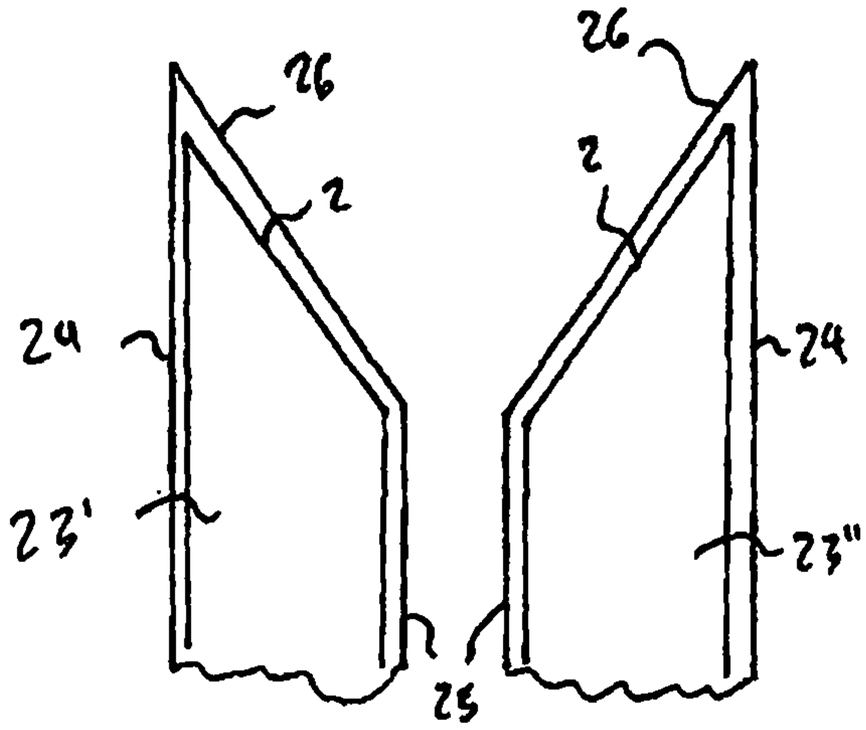

Fig. 5d

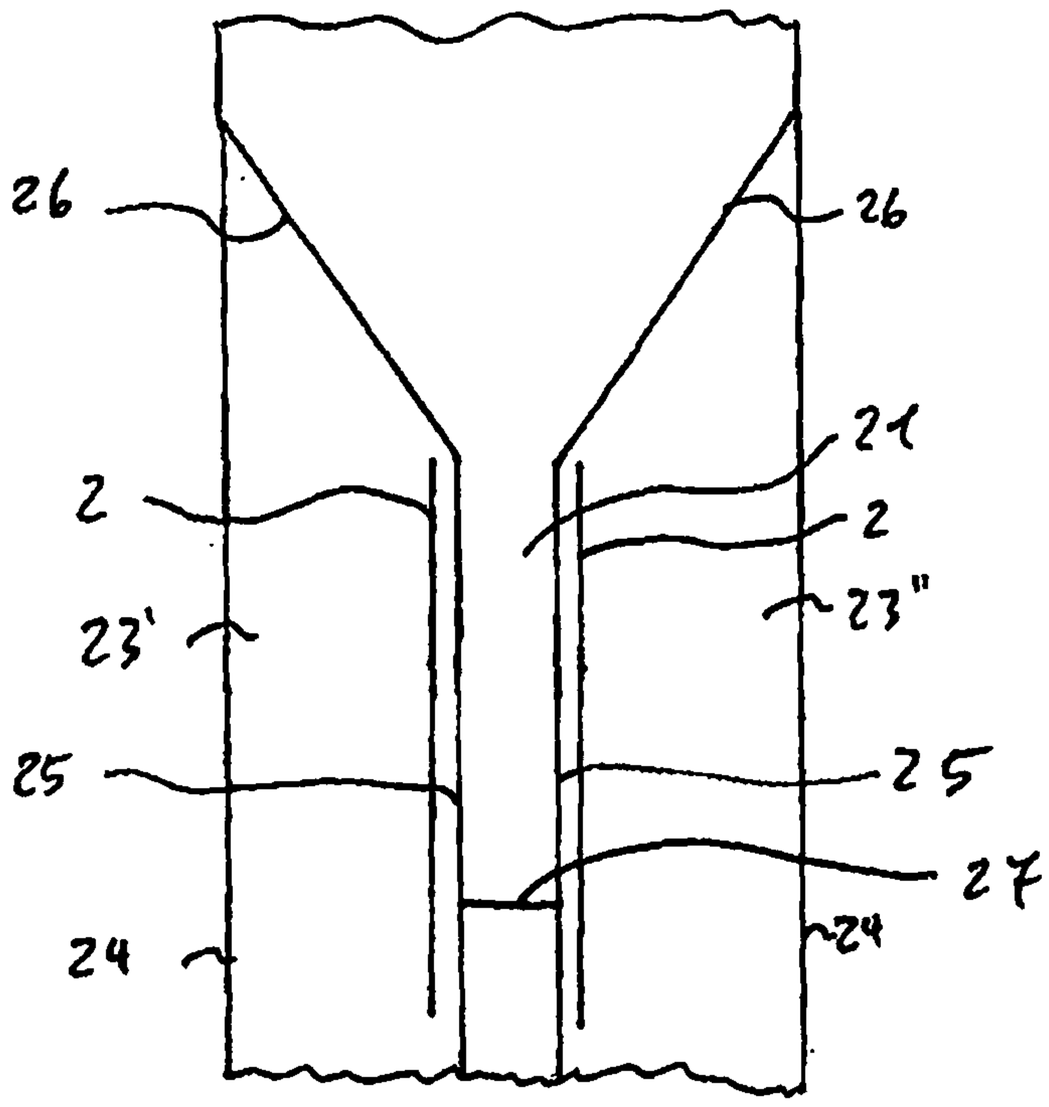

Fig. 5e

APPARATUS AND METHOD FOR SECURING AN END OF A STRIP TO A TAMBOUR

CROSS REFERENCE TO PRIOR APPLICATIONS

This application is a U.S. National Phase Application under 35 U.S.C. § 371 of International Application No. PCT/IB2009/005065, filed Feb. 19, 2009, which claims priority to German Application No. DE 10 2008 009 958.9, filed Feb. 20, 2008. The International Application was published in German on Sep. 24, 2009 as WO 2009/115915 under PCT Article 21 (2).

FIELD

The invention relates to a device and a method for securing a web end on a drum. In particular, the invention relates to a method and a device for securing a free web end during a change of drum.

BACKGROUND

In the paper industry, paper webs are rolled onto a drum and stored thus. The problem arises that web ends can move freely in particular during a change of drum and thus tear free and possibly cause damage. For example, the web ends can unintentionally be wound with a different paper web onto a different drum, where it can lead to rejects being produced.

In DE 100 85 234 T1, a method and a device for change of reel are described, in which a paper web to be wound onto a bobbin core is moved, to form a lap, by at least the rotary force of the winding cylinder and the cleavage load, wherein in connection with the change of reel a new bobbin core is brought into nip contact with the winding cylinder together with a replacement device above the winding cylinder.

SUMMARY OF THE INVENTION

It is an aspect of the present invention to provide a device and a method which prevent web ends from coming loose.

In an embodiment, a method is provided for securing a web end (**23**) of a paper web on a first drum (**11**) during a change of drum from a first drum (**11**) onto a second drum (**12**), wherein the web end (**23**) passes between a Pope roller (**10**) and the second drum (**12**), has adhesive (**2**) applied to it and is wound onto the first drum (**11**).

The application of the adhesive preferably prevents a release of the existing tensile stress of the paper web after the separation, and a lateral displacement of the topmost layers of the paper web.

A web end is preferably the end of a fabric web, cardboard web or plastic web, particularly preferably the end of a paper web.

An adhesive is a product that is suitable for gluing paper webs together. Preferably, the adhesive comprises modified starch. Preferably, the adhesive can be dissolved again in the dissolver. Preferably, the adhesive is water-soluble. Preferably, the adhesive is suitable for gluing paper webs fast against each other quickly and with a long-term memory effect.

Preferably, the adhesive is applied to an area of the web end which has passed through a nip between the Pope roller and the second drum. The adhesive is thereby applied in such a way that the adhesive does not stick to the Pope roller.

Preferably, the adhesive is applied to an area of the web end which is located on a downward-rotating area of the Pope roller. The adhesive is thereby applied to the web end in such a way that it travels a short distance until the web end sticks on the first drum. This minimizes possible contamination.

Preferably, the adhesive (**2**) is applied to the area of the web end (**23**) at an angle of impact of 1° to 30°.

The angle of impact is equal to zero if the direction of movement of the adhesive (**2**) is the same as the direction of movement of the web end (**23**).

An angle of impact of 1° to 30° has the advantage that the second drum (**12**) is particularly well protected from being wetted with adhesive.

Preferably, the adhesive (**2**) is applied to the area of the web end (**23**) at an angle of impact of 150° to 179°. The web end is thereby particularly intensively wetted with adhesive.

Preferably, the adhesive (**2**) is applied to the area of the web end (**23**) at an angle of impact of 80° to 100°. The adhesive can thereby be applied particularly accurately to a specific area.

Preferably, the adhesive (**2**) is applied to the area of the web end (**23**) with a distance to the nip between the Pope roller (**10**) and the second drum (**12**) of $^{2}/_{360}$ to $^{90}/_{360}$ of the circumference of the Pope roller (**10**). A particularly large and stable adhesion surface thereby results.

Preferably, the adhesive (**2**) is applied to the area of the web end (**23**) with a distance to the nip between the Pope roller (**10**) and the second drum (**12**) of $^{2}/_{360}$ to $^{20}/_{360}$ of the circumference of the Pope roller (**10**). The adhesive can therefore be applied to the outermost end of the web end. A small part of the web is utilized for the adhesion surface.

Preferably, the adhesive (**2**) is applied to the area of the web end (**23**) with a distance to the nip between the Pope roller (**10**) and the second drum (**12**) of $^{70}/_{360}$ to $^{90}/_{360}$ of the circumference of the Pope roller (**10**). The risk of adhesive reaching the outside of the first drum (**11**) is thereby reduced.

Preferably, the adhesive (**2**) is applied to the area of the web end (**23**) with a distance to the nip between the Pope roller (**10**) and the second drum (**12**) of $^{30}/_{360}$ to $^{50}/_{360}$ of the circumference of the Pope roller (**10**). A compromise between the utilization of the web and the reduction of the risk of adhesive reaching the outside of the first drum (**11**) is thereby reached.

Preferably, the adhesive is applied to an area of the web end which is located between the first and second drums and/or on the first drum. It is thereby possible to position an adhesive applicator in many different areas, with the result that there is a large degree of freedom as regards the utilization of the overall space.

Preferably, the web end is produced by means of severing a web, the severing of the web comprising the introduction of a first separation mark and a second separation mark, wherein the first separation mark runs from a central area to a first outer edge of the web and the second separation mark runs from the central area to a second outer edge of the web. It is thereby possible to sever the web in such a way that small differences in tensile stress occur.

Preferably, the severing of the web is synchronized with the application of the adhesive. Preferably, the severing of the web is time-synchronized with the application of the adhesive. It is thereby possible to apply the adhesive only when it is needed. It is possible to apply the adhesive only to the web end. Preferably, the severing of the web is spatially synchronized with the application of the adhesive. It is thereby possible to apply the adhesive precisely to the spots where it is needed.

Preferably, the adhesive is applied along an outer edge and/or an inner edge and/or a separation front. Particularly preferably, the adhesive is applied along and at a distance from an outer edge and/or an inner edge and/or a separation front. The separation front preferably comprises a straight separation edge, particularly preferably a curved separation edge.

The object is also achieved by a device comprising a first drum, a second drum, a Pope roller and at least one adhesive applicator, wherein the second drum and the Pope roller form a nip and the adhesive applicator is positioned behind the nip in the direction of feed of the Pope roller and of the second drum. It is thereby possible to apply the adhesive in a simple way.

An adhesive applicator is a device which is suitable for applying adhesive to the paper web. Preferably, the applicator comprises a mechanical, particularly preferably a pneumatic, device. Preferably, the applicator has an injection or spray device. Particularly preferably, the applicator has a nozzle.

Preferably, the adhesive applicator (**32**) can be directed at an angle of 1° to 179° towards an area of the paper web passing through (**20**).

Preferably, the adhesive applicator (**32**) can be directed at an angle of 1° to 30° towards an area of the paper web passing through (**20**).

Preferably, the adhesive applicator (**32**) can be directed at an angle of 150° to 179° towards an area of the paper web passing through (**20**).

Preferably, the adhesive applicator (**32**) can be directed at an angle of 80° to 100° towards an area of the paper web passing through (**20**).

Preferably, the range of angles at which the adhesive applicator (**32**) can be directed towards an area of the paper web passing through (**20**) can be adjusted between 1° and 179°.

Preferably, the adhesive applicator (**32**) can be directed with a distance to the nip between the Pope roller (**10**) and the second drum (**12**) of $^{2}/_{360}$ to $^{90}/_{360}$ of the circumference of the Pope roller (**10**) towards an area of the paper web passing through (**20**).

Preferably, the adhesive applicator (**32**) can be directed with a distance to the nip between the Pope roller (**10**) and the second drum (**12**) of $^{2}/_{360}$ to $^{20}/_{360}$ of the circumference of the Pope roller (**10**) towards an area of the paper web passing through (**20**).

Preferably, the adhesive applicator (**32**) can be directed) with a distance to the nip between the Pope roller (**10**) and the second drum (**12**) of $^{70}/_{360}$ to $^{90}/_{360}$ of the circumference of the Pope roller (**10**) towards an area of the paper web passing through (**20**).

Preferably, the adhesive applicator (**32**) can be directed with a distance to the nip between the Pope roller (**10**) and the second drum (**12**) of $^{30}/_{360}$ to $^{50}/_{360}$ of the circumference of the Pope roller (**10**) towards an area of the paper web passing through (**20**).

Preferably, the distance to the nip between the Pope roller (**10**) and the second drum (**12**) with which the adhesive applicator (**32**) can be directed towards an area of the paper web passing through (**20**) can be adjusted between $^{2}/_{360}$ and $^{90}/_{360}$ of the circumference of the Pope roller (**10**).

Preferably, the device comprises a separator. The separator is preferably set up to produce a separation front which severs the web and thereby produces a web end. It is thereby possible to both produce the web end in a device and glue it to the second drum.

The separator preferably comprises a blade, a laser beam or an air jet, particularly preferably a water jet.

Preferably, the adhesive applicator is set up to apply adhesive to an adhesion area of the web end which runs along at an outer edge and/or an inner edge of the web end.

Particularly preferably, the adhesive applicator is set up to apply adhesive to an adhesion area of the web end which runs along by a separation front. It is thereby possible to use the adhesive at precisely the spots where it is needed. Particularly preferably, the adhesion area is at a distance from the separation front. It is thereby possible to prevent adhesive from being applied next to the web end or from spilling out next to the web end when the web end is attached to the second drum.

Preferably, the adhesive applicator is set up to apply adhesive to an area of the web or of the web end which will pass through a nip between the second drum and the Pope roller at the same time as an area of the separation front which is separated by the separator at the same time. It is thereby possible in a simple way to adapt the application of adhesive to the separation front.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is explained in more detail below with reference to the drawings.

FIG. **1** shows a partial cross-section through a device for gluing a web end onto a drum with an adhesive-spraying unit.

FIG. **2** shows a partial plan view of the arrangement according to FIG. **1**.

FIGS. **3***a*-**3***e* show a partial cross-section in schematic representation and a partial plan view of a device for gluing a web end onto a drum and represent different variants for the application of the adhesive.

FIGS. **4***a*, **4***b* show variants for the design of the separation front.

FIGS. **5***a*-**5***e* show further variants for the application of the adhesive.

DETAILED DESCRIPTION

FIG. **1** shows a partial cross-section through a device for gluing a web end on a drum. A paper web **20** runs over a Pope roller **10** onto a first drum **11**.

A separator **50** with two water-jet nozzles **52** and a third water-jet nozzle **51** is positioned in front of the nip between the Pope roller **10** and a second drum **12**. The water jet nozzles **52** can move transversely to the direction of travel of the paper web.

An adhesive-spraying unit **33** is positioned behind the nip between the Pope roller **10** and the second drum **12**. The adhesive-spraying unit **33** is directed towards an area of the paper web **20** which is located on a downward-rotating area of the Pope roller **10**.

If the paper web **20** is separated by the separator **50** in such a way that a web end **23** forms, an adhesive **2** is sprayed onto the web end **23** with the adhesive-spraying unit **33**, with the result that this glues the web ends **23** to the drum **11** during winding onto the first drum **11**.

FIG. **2** shows how the paper web **20** is separated in the form of a separation front **22** which first forms a narrow guide strip **21** in the centre of the paper web **20** which is widened symmetrically to the edges of the paper web **20** as the separation process continues. When the guide strip **21** is widened, the separation front **22** forms two straight lines which each run from the sides of the guide strip **21** to the

edges of the paper web **20**. The guide strip **21** here is partly wound onto the second drum **12**. Thus the guide strip **21** is missing from the first drum.

The separation front **22** is produced by means of two water jets **53'**, **53"** (seen here in side view as one water jet **53**) of the separator **50**, as shown in FIG. **1**. The two water jets **53'** and **53"** are first kept at a short distance from each other, in order to produce the guide strip **21**. After the guide strip **21** has been produced, the distance between the two water jets **53'** and **53"** is increased, until they have been led to the edges of the paper web **20** and have in this way severed the paper web **20** completely. A two-part web end **23** thereby results. If the guide strip **21** is severed, two parts of the guide strip **21** form. One of the two parts lies on the side of the first drum, the second part of the guide strip **21** lies on the side of the second drum. If the rotation of the first drum **11** slows down, the web end **23** and the part of the guide strip **21** which lies on the side of the first drum **11** can damage the paper web **20** or remnants can tear due to the centrifugal forces and enter the nip of the second drum **12**. To prevent this, the web end **23** and the part of the guide strip **21** which lies on the side of the first drum **11** are glued fast with adhesive **2** by the adhesive-spraying unit **33** shown in FIG. **1**.

FIGS. **3***a*-**3***e* show, on the left, a partial cross-section in schematic representation and, on the right, a partial plan view of a device for gluing a web end on a drum and represent different variants for the application of the adhesive.

FIG. **3***a* shows a schematic cross-section view of the device for gluing a web end on a drum with adhesive-spraying units **32'** and **32"**. The adhesive-spraying units **32'** and **32"** are positioned by the first drum **11** below the Pope roller **10** in the downward-rotating area. The adhesive **2** is added at a distance to the nip of the first drum **11** which corresponds to the distance from the high-pressure water-cutting jet (which is closest to the second drum **12**) to the nip of the first drum **11**. When changing the paper web **20** onto the second drum **12**, a two-part web end **23** forms. The application of the adhesive **2** to the first drum **11** ensures that the web ends **23** are wound smoothly onto the first drum **11**.

The adhesive is a water-soluble, fast-acting adhesive with a high adhesive strength in order that a small metered dose holds the two-part web end **23** on the first drum **11**. This adhesive can be dissolved in the dissolver. The adhesive does not become more concentrated over time. The adhesive does not leave any spots or stains on the paper. The adhesive-based holding system is cheaper than mechanical systems which smooth the web with rollers or brushes as the first drum rotates in order to prevent air from entering.

FIG. **3***b* shows, in a schematic plan view of the device shown in FIG. **3***a* for gluing a web end on a drum, a possibility for applying the adhesive **2** to the two-part web end **23**. The adhesive **2** is here applied to the two-part web end **23** adjacent to the two edges of the paper web **20**.

The web end **23** can thereby be particularly effectively glued to the first drum **11**, since an optimum amount of adhesive **2** is used in this way.

FIG. **3***c* shows, in a schematic plan view of the device shown in FIG. **3***a* for gluing a web end on a drum, a further possibility for applying the adhesive **2** to the web end. The adhesive **2** is here applied extensively to virtually the whole of the web end **23**. The web end **23** is thereby glued particularly securely to the first drum **11**. The spraying-on of the adhesive **2** is adapted to the shape of the narrowing web end **23**. An excess of adhesive **2** is thereby avoided, so as not to touch the surface of the Pope roller **10** that is becoming free.

FIG. **3***d* shows a schematic cross-section view of the device for gluing a web end on a drum with adhesive-spraying units **32'** and **32"**. The adhesive-spraying units **32'** and **32"** are positioned by the first drum **11** above the Pope roller **10**. They are directed towards a downward-rotating area of the first drum **11**. It is thereby possible to apply adhesive **2** to the paper web **20** in such a way that it is immediately covered by the paper web **20**.

FIG. **3***e* shows, in a schematic plan view of the device shown in FIG. **3***d* for gluing a web end on a drum, a further possibility for applying the adhesive **2** to the web end **23**. The adhesive is here applied to the web end **23** adjacent to the outer edges of the paper web **20**.

FIGS. **4***a*, **4***b* show variants for the design of the separation edge **26**.

In FIG. **4***a*, a separation edge **26** is shown which has been produced by the water jet nozzles **52** having been guided outwards, quickly at first and then more slowly.

In FIG. **4***b*, a separation edge **26** is shown which has been produced by the water jet nozzles **52** having been guided outwards, firstly not at all, then slowly and then more quickly.

FIGS. **5***a*-**5***d* show further variants for the application of the adhesive **2**. In each case, a two-part web end **23'** and **23"** is shown, to which an adhesive **2** has been applied. The two-part web end **23'** and **23"** comprises strips that are symmetrical to each other. The two-part web end **23'** and **23"** has two outer edges **24**, two inner edges **25** and two separation edges **26**, which extend diagonally from the respective inner edge **25** to the respective outer edge **24**. The separation edges **26** run in such a way that they form an acute angle with the outer edges **24** and an obtuse angle with the inner edges **25**.

In FIG. **5***a*, the adhesive **2** is applied to the two-part web end **23'** and **23"** in each case in the form of a line parallel to the separation edges **26**. The adhesive is at a distance both from the separation edges **26** and from the outer edges **24** and the inner edges **25**.

Because the adhesive **2** is applied parallel to the separation edges **26**, the adhesion spot has a spiral shape and glues the two-part web end **23'** and **23"** at all points in time of the gluing in the respectively critical area which could come loose. Because the adhesive **2** is applied at a distance both from the separation edges **26** and from the outer edges **24** and the inner edges **25**, the adhesive **2** is prevented from reaching components or areas of the paper web **20** on which it is not desired.

In FIG. **5***b*, the adhesive **2** is applied to the two-part web end **23'** and **23"** in each case in the form of a line parallel to the outer edges **24**.

Because the adhesive **2** is applied in the form of a line parallel to the outer edges **24**, a lateral displacement of the two-part web end **23'** and **23"** is effectively prevented.

In FIG. **5***c*, the adhesive **2** is applied to the two-part web end **23'** and **23"** in each case in the form of a line parallel to the inner edges **25** and the separation edges **26**.

Because the adhesive **2** is applied in addition to the area described in FIG. **5***a* parallel to the inner edges **25**, a lateral displacement of the two-part web end **23'** and **23"** is even more effectively prevented.

In FIG. **5***d*, the adhesive **2** is applied to the two-part web end **23'** and **23"** in each case in the form of a line parallel to the inner edges **25**, the outer edges **24** and the separation edges **26**.

Because the adhesive **2** is applied parallel both to the separation edges **26** and to the inner edges **25** and the outer edges **24**, a slippage of the two-part web end **23'** and **23"** is particularly securely prevented.

In FIG. **5***e*, the adhesive **2** is applied to the two-part web end **23'** and **23"** in each case in the form of a line parallel to the inner edges **25**. The adhesive **2** is applied at a distance both from the outer edges **24** and from the separation edges **26** and the inner edges **25**.

In FIG. **5***e*, the guide strip **21** is also shown. This lies between the inner edges **25** and the separation edges **26** of the two-part web end **23'** and **23"**.

LIST OF REFERENCE NUMBERS

2 adhesive
10 Pope roller
11 first drum (mother roll)
12 second drum
20 paper web
21 guide strip
22 separation front
23 web end
24 outer edge
25 inner edge
26 separation edge
32 adhesive-spraying unit
33 adhesive-spraying unit
50 separator
51 third water-jet nozzle
52 water jet nozzle
53 water jet, beam

The invention claimed is:

1. A method for making paper in a paper making machine comprising securing a web end of a paper web on a first drum during a change of drum from the first drum to a second drum, the method comprising

severing the paper web so as to form the web end before a first nip between a Pope roller and the second drum;

passing the web end through the first nip, the web end being adhesive-free when it passes through the first nip; and

applying adhesive into a region adjacent a second nip between the Pope roller and the first drum in such a way that the adhesive is applied to a first area of the paper web and a second area of the paper web immediately covers the adhesive during winding of said first and second areas of the paper web onto the first drum, one of said first and second areas of the paper web being the web end that is being secured to the first drum;

wherein the severing of the paper web is performed simultaneously with the applying of the adhesive and the adhesive is located along the web end as the web end is wound onto the first drum such that the web end sticks to the first drum.

2. The method as recited in claim **1**, wherein the applying is performed at an angle of impact of 1° to 30°.

3. The method as recited, in claim **1**, wherein the applying is performed at an angle of impact of 150° to 179°.

4. The method as recited in claim **1**, wherein the applying is performed at an angle of impact of 80° to 100°.

5. The method as recited in claim **1**, wherein the applying is performed at a distance to the first nip of $^{2}/_{360}$ to $^{90}/_{360}$ of the circumference of the Pope roller.

6. The method as recited in claim **1**, wherein the applying is performed at a distance to the first nip of $^{2}/_{360}$ to $^{20}/_{360}$ of the circumference of the Pope roller.

7. The method as recited in claim **1**, wherein the applying is performed at a distance to the first nip of $^{70}/_{360}$ to $^{90}/_{360}$ of the circumference of the Pope roller.

8. The method as recited in claim **1**, wherein the applying is performed at a distance to the first nip of $^{30}/_{360}$ to $^{50}/_{360}$ of the circumference of the Pope roller.

9. The method as recited in claim **1**, wherein the severing of the paper web includes introducing a first separation mark running from a central area to a first outer edge of the web and a second separation mark running from the central area to a second outer edge of the web.

10. The method as recited in claim **1**, where the applying of adhesive to the papa web comprises applying adhesive to an area of the paper web that is on the Pope roller.

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